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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
ROBERTS, BRIAN S	

ART UNIT	PAPER NUMBER
2662	

DATE MAILED: 03/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/922,486	SUBRAMANIAN ET AL.	
	Examiner	Art Unit	
	Brian Roberts	2662	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 August 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *01 October 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *12/04/2001*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Claims 1-16 have been examined.

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "410" has been used to designate both the "Reconfigurable DECODE Function Kernel Plane" and the "Bit Field Extraction". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawings sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to because "100b" should be "101" in Figure 4 to remain consistent with the disclosure. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawings sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must

be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the description: 506, 510 and 512. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheets should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

4. The disclosure is objected to because of the following informalities:

- "I 02a" should read "102a" (page 8 line 35; page 13 line 22)
- "11Oa" should read "110a" (page 9 line 6)
- "501-403" should read "501-503" (page 44 line 16)

Appropriate correction is required.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 1, 2, 4, 7-9, and 12-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mobin et al. in view of Cahill.

- In reference to claim 1

Mobin et al. teaches in Figure 1A a receiver that comprises of:

- An adaptive frequency correction rotation subunit (32) (claim 1 – a derotator for correcting for frequency offset in the sampled TDMA signal)
- an equalizer (34) (claim 1 – an equalizer to which is applied an output signal from the matched filter)

- a deinterleaver (36) (claim 1 – a deinterleaver to deinterleave the received TDMA signal)
- a channel decoder (42) (claim 1 – a channel decoder for decoding the received TDMA signal after it is deinterleaved)

Mobin et al. does not teach the use of a sampler for sampling a TDMA signal or matched filter for correcting for the response of the transmission channel in the received TDMA signal.

Cahill teaches in Figure 1 the use of a matched filter (137) (claim 1 – a match filter for correcting for the response of the transmission channel in the received TDMA signal) and a sampler (139) (claim 1 – a sampler for sampling a TDMA signal received from a transmission channel) for sampling the received TDMA signal (102) (column 7 lines 45-48) in a communications receiver.

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify a receiver as taught by Mobin et al. to include a sampler for sampling the received TDMA signal and a match filter as taught by Cahill whose output is applied to an equalizer in order to maximize the signal to noise ratio and correct for the response of the transmission channel on the received signal.

- In reference to claims 2 and 4,

Mobin et al. teaches a receiver that covers substantially all limitations of these claims.

Mobin et al. does not teach a filter for filtering the received TDMA signal before the sampler samples it.

Cahill teaches a matched filter (137) in a communications receiver that is inherently used for pulse shaping the received signal (claim 4 – a matched filter for pulse shaping the received TDMA signal) before the sampler samples it. (column 8 lines 10-18, Figure 1) (claim 2- a filter for filtering the received TDMA signal before it is sampled by the sampler)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the receiver as taught by the combination of Mobin et al. and Cahill to include a match filter that filters the received signal before it is sampled by the sampler as taught by Cahill in order to maximize the signal to noise ratio of the signal before sampling it.

- In reference to claim 7-9,

Mobin et al. teaches a receiver that covers substantially all limitations of these claims.

Mobin et al. does not teach a scaler or automatic gain control circuit for controlling the scaler.

Cahill teaches an adjustable gain preamplifier (105) (claim 7 – scaler for adjusting the magnitude of the received TDMA signal) that receives feedback from the energy estimator (205) (claim 8 – automatic gain control circuit for controlling the scaler) based on the energy level of the received signal (column 8 lines 64-68. column 9 lines

1-17, Figures 1-2) (claim 9 – estimator for determining the received signal strength and providing an estimate of received signal strength to the automatic gain control circuit)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the receiver as taught by the combination of Mobin et al. and Cahill to include an adjustable gain preamplifier that receives feedback from the energy estimator based on the energy level of the received level as taught by Cahill in order to control clipping and severe distortion of the received signal.

- In reference to claim 12-14,

Mobin et al. teaches a receiver that covers substantially all limitations of these claims.

Mobin et al. teaches an automatic frequency correction unit (58) that provides a feedback signal to the frequency correction rotation sub-unit (32) in order to adjust the phase of incoming signals thus substantially reduce communication errors. (column 6 lines 26-40, Figure 1A) (claim 12 – frequency offset estimator for estimating frequency offset and adjusting the derotator to response to such an estimate) Mobin et al. further teaches using the automatic frequency correction unit (58) to determine if the channel quality indication signal is acceptable. (column 7 lines 12-59) (claim 13 – received signal quality metric indicator for measuring signal quality of the received TDMA signal) The automatic frequency correction unit (58) provides feedback to the frequency correction sub-unit (32), thus ultimately conditioning a response from the channel decoder. (Figure

1A) (claim 14 – the measurement of signal quality is used to condition an output signal from the channel decoder)

- In reference to claim 15,

Mobin et al. teaches a receiver that covers substantially all limitations of these claims.

Mobin et al. teaches the design choice of a cyclic decoder (72) and a speech decoder (74) for decoding an output signal from the channel decoder (42). (Figure 1, column 6 lines 12-20) (claim 15 – a block decoder for decoding an output signal from the channel decoder)

7. Claims 3 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mobin et al. in view of Cahill, as applied to claim 1 and above, and further in view of Sato.

- In reference to claim 3

The combination of Mobin et al. and Cahill as discussed in section 6 above show the limitations claimed for the receiver.

Mobin et al. and Cahill do not teach an interpolation filter for upsampling the received signal.

Sato teaches an interpolation filter (103) used to re-sample the signal at a frequency higher than the sampling frequency of the A/D converter. (Figure 1, abstract,

column 5 lines 56-62) (claim 3 – interpolation filter for upsampling the received TDMA signal).

It would have been obvious to a person of ordinary skill in the art at the time of the invention to further modify the combination of Mobin et al and Cahill to include an interpolation filter as taught by Sato in order to re-sample the signal at a frequency higher than the sampling frequency of the A/D converter. This allows samples to be generated in between those actually sampled by the A/D converter and allows the interpolator to adjust the effective sampling frequency and phase of the signal.

- In reference to claim 16

Mobin et al. teaches in Figure 1A a receiver that comprises of:

- An adaptive frequency correction rotation subunit (32) (claim 16 – a derotator)
- an equalizer (34) (claim 1 – an equalizer)
- a deinterleaver (36) to which a output signal is applied from the equalizer (claim 16 – a deinterleaver to which is applied an output signal from the equalizer)
- a channel decoder (42) to which is applied an output signal from the deinterleaver (claim 16 – a channel decoder to which is applied an output signal from the deinterleaver)

- a cyclic decoder (72) and a speech decoder (74) for decoding an output signal from the channel decoder (42). (Figure 1) (claim 16 – a block decoder for decoding an output signal from the channel decoder)

Mobin et al. does not teach a TDMA communications receiver with a pulse shaping matched filter receiving input from an interpolation filter. Mobin et al. does not teach a sample selector receiving input from the pulse shaping matched filter. Mobin et al. does not teach the adaptive frequency correction subunit receiving input from a sample selector. Mobin et al. does not teach a scaler receiving input from the adaptive frequency correction subunit. Mobin et al. does not teach a matched filter whose input is from the scaler. Mobin et al. does not teach the equalizer receiving input from the matched filter.

Cahill teaches in figure 1 a TDMA communications receiver:

- a matched filter (52) in a communications receiver that is inherently used for pulse shaping the received signal (claim 16 – a pulse shaping matched filter)
- a sampler to which is applied an output signal from the pulse shaping matched filter (139) (claim 16 – a sample selector to which is applied an output signal from the pulse shaping matched filter)
- an adjustable gain preamplifier (105) (claim 16 – a scaler)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the receiver as taught by Mobin et al. to include a pulse shaping matched filter as taught by Cahill in order to maximize the signal to noise ratio of the

signal before the output is received by the sampler that samples the received TDMA signal before it is inputted into the adaptive frequency correction subunit. It would have been further obvious to a person of ordinary skill in the art for the output of the adaptive frequency correction subunit as taught by Mobin et al. to be received by an adjustable gain amplifier in order to prevent clipping or distortion of the signal as taught by Cahill. It would have been further obvious to a person of ordinary skill in the art for the output of the gain amplifier to be inputted into a matched filter as taught by Cahill in order to maximize the signal to noise ratio before the signal is received by an equalizer as taught by Mobin et al.

The combination of Mobin et al. and Cahill as discussed above show the limitations claimed for the receiver.

Mobin and Cahill do not teach an interpolation filter to which the TDMA signals are applied and whose output the pulse shaping matched filter receives.

Sato teaches an interpolation filter (103) used to re-sample the signal at a frequency higher than the sampling frequency of the A/D converter. (Figure 1, abstract, column 5 lines 56-62) (claim 16 – an interpolation filter to which the TDMA signals are applied)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the receiver as taught by Mobin et al. and Cahill to include an interpolation filter for upsampling the received TDMA signal before the pulse shaping matched filter is used to maximize the signal to noise ratio.

8. Claim 5-6, and 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mobin et al. in view of Cahill, as applied to claim 1 and above, and further in view of Wright et al.

- In reference to claims 5-6,

The combination of Mobin et al. and Cahill teach a receiver that covers all limitations of the parent claim.

Mobin et al. and Cahill do not teach a Nyquist filter used to upsample the received signal.

Wright et al. teaches a method where the matched and pulse-shaping filters work together as a Nyquist filter (claim 5 – Nyquist filter) used for upsampling the received signal and to inherently reduce intersymbol interference. (Figure 2, abstract, column 1 lines 10-16) (claim 6 – Nyquist filter upsamples the received TDMA signal and performs the functions of a Nyquist filter)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the receiver as taught by the combination of Mobin et al. and Cahill to include a Nyquist filter as taught by Wright et al. in order to upsample the received signal and to inherently reduce intersymbol interference.

- In reference to claim 10-11,

The combination of Mobin et al. and Cahill teach a receiver that covers all limitations of the parent claim.

Mobin et al. and Cahill do not teach a channel impulse response estimator for estimating the response of the transmission channel and updating the coefficients of the matched filter or a delay-epoch estimator for controlling the sampler in response to an input from the channel impulse response estimator.

Wright et al. teach a coefficient generator (80) that produces a set of filter coefficients whose values depend on the output of the timing-recovery circuit. (column 5 lines 47-49) The coefficients inherently represent the filter's impulse response and thus the coefficient generator acts as a channel impulse response estimator. (column 5 lines 57-68, column 6 lines 1-29) (claim 10 – a channel impulse response estimator for estimating the response of the transmission channel and updating the coefficients of the matched filter) The timing-recovery circuit (60) and matched output filter (52) inherently act as the delay-epoch estimator, since the coefficient generator acts as the channel impulse response estimator and the timing-recovery circuit and matched filter receive input from the coefficient generator to impose the delays for the required timing of the device. (claim 11 – a delay-epoch estimator for controlling the sampler in response to an input from the channel impulse response estimator)

It would have been obvious to a person of ordinary skill in the art at the time of the invention to modify the receiver as taught by the combination of Mobin et al. and Cahill to include a coefficient generator as taught by Wright et al. to update the coefficients of the matched filter in order to avoid errors caused from intersymbol interference and to provide feedback to the sampler from the channel impulse response estimator to select the data sample that corresponds to the timing signal generated by

the timing circuit (60), and matched filter (52) while receiving input from the coefficient generator (80).

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure are:

- Toki et al. (US 2002/0021687 A1) teaches a time-division multiplexing radio system.
- Gans et al. (US 5943372) teaches a digital data reception apparatus containing filters, an equalizer, a deinterleaver, and a channel decoder.
- Nagayasu (US 2003/0012310 A1) teaches a TDMA communications receiver.
- Currivan et al. (US 5898684) teaches a TDMA burst receiver.
- Nefedov (US 2001/0004359 A1) teaches a method and arrangement for multiplexing several users to the communication channels of a TDMA system.
- Claydon et al. (US 5668831) teaches a signal processing apparatus for digital communications that includes a Nyquist filter, gain control, an adaptive equalizer, and a deinterleaver.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian Roberts whose telephone number is (571) 272-3095. The examiner can normally be reached on M-F 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on (571) 272-3088. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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